AMENDMENTS TO THE SPECIFICATION:

Page 1, immediately preceding the paragraph commencing "This invention relates to apparatus and..." insert the following heading and sub-heading:

BACKGROUND

1. Technical Field

Page 2, between lines 6 and 7, insert the following sub-heading:

2. Related Art

Page 1, commencing at line 7, begin a new paragraph:

Hitherto, two approaches have been followed in this area. The Web Services Interoperability organisation (WS-I) have proposed a common web service profile language which describes the service in terms of how to invoke it, whilst the Defence Advanced Research Projects Agency (DARPA)Web (DARPA) Web Service group [[have]] has developed an XML-based service description language known as DAML-S, which describes the service in terms of what it does. DAML-S does not have a descriptive ontology for interactions, but does have a process model which can be used to explicitly describe protocols. This is described by Ankolekar et al in the *Proceedings of First International Conference on the Semantic Web, Sardina, Italy[[.]], Jun. 9th-12th, 2002.*

Page 1, immediately preceding the paragraph commencing at line 23, insert the

following heading:

BRIEF SUMMARY

Page 1, paragraph commencing at line 23:

According to the present exemplary embodiment invention, there is provided

apparatus for supporting negotiations comprising a group of agent means, wherein at

least one of the agent means comprises means for initiating interactions between the

agent means, and means for defining the negotiation in terms of one or more phases

during which particular parts of the negotiation are completed, such that the responses

to requests in an earlier phase in the process constrain the responses generated in

subsequent phases, and wherein each agent means has means for dynamically

negotiating an agreement in accordance with the said definition.

Pages 1-2, bridging paragraph:

The present exemplary embodiment invention also provides a method for

performing negotiations using a plurality of computer-based agent means, wherein one

of the agent means initiates interactions between the agent means, and the agent

means dynamically negotiate an agreement, and the negotiation process is defined in

terms of one or more phases during which particular parts of the negotiation are

completed, such that the responses to requests in an earlier phase in the process constrain the responses generated in subsequent phases.

Page 2, 1st and 2nd full paragraphs:

The present <u>exemplary embodiment</u> ~~invention~~ also extends to a computer program or suite of computer programs for use with one or more computers comprising a set of instructions to carry out the method of the invention or to provide the apparatus.

The <u>exemplary embodiment</u> ~~invention~~ allows the negotiation process to be opened, interpreted and executed as a number of phases, the outcome of each phase being used to infer the possible set of states at subsequent phases. The availability of options for decisions during each phase of the negotiation may be constrained relative to the possible states of the overall negotiation. Because the rules of subsequent phases can be retrieved, agents following these rules can, therefore, use the constraints that will be imposed in the later phases of the negotiation to determine their actions in the early phases of the negotiation. For example, they can use a constraint on the price which is to be negotiated later to determine the bid ranges they should operate in for an early quality phase.

Page 2, paragraph commencing at line 21:

In contrast to the prior art systems, the present <u>exemplary embodiment</u> ~~invention~~ uses a componentized characterization of the description of the interaction rules between the participants in the negotiation, which differs from the prior art systems discussed above in that the phases of negotiation are decomposed more fully. The process places more emphasis on lifecycle rules, describes transitions in the negotiation process instead of just termination rules, and imposes constraints between the phases of the negotiation. Instead of attempting to handle all the constraints together, the process handles them stepwise. Thus, at each phase, the number of dimensions of the search space to be evaluated by a participant deciding on the optimal response, and the range of possible solutions, strategies and decisions within those dimensions, are smaller than in the prior art single phase systems.

Page 3, 1st and 2nd paragraphs:

This process more closely follows the behaviours expected of human participants in an auction process, in which possible outcomes are first identified and more detailed negotiation is then limited to those possibilities. The <u>exemplary embodiment</u> ~~invention~~ is, therefore, arranged to interpret these descriptions and act on them. In particular, the descriptions of the process are in terms of the phases of activity in an interaction. For example, using the present <u>exemplary embodiment,</u> ~~invention~~ it is possible to specify a

pre-qualification phase, a phase in which the characteristics of the commodity are negotiated and a phase in which the price of the commodity is negotiated. The outcomes of the phases of the negotiation can be tied together in a way that can be interpreted by a program; it is possible to specify a concept like "the price agreed in a given phase will be the only price that will be legal in subsequent phases". This is significant because it constrains the size of the space that agents must reason over when composing bids at each phase. A constraint specified for an earlier phase may therefore be used to constrain the reasoning to be used in a later phase. A constraint can also be used in reasoning of phases previous to the one in which the constraint will appear. For example, agents that interpret the service description will be able to determine that, if price will be constrained in a subsequent phase, other considerations that are the subject of the current phase (quality, time of delivery, support and servicing) must be subordinate to the price at which the product can be offered.

The exemplary embodiment invention may be implemented in a peer-to-peer fashion, the necessary processing programming being downloaded to potential users. It could also be implemented over fixed servers, in which a server having the necessary software acts as the end user's agent.

Page 3, immediately preceding the paragraph commencing at line 23, insert the following heading:

BRIEF DESCRIPTION OF THE DRAWINGS

Page 3, amend the brief descriptions of the drawings as follows:

FIG. 1 shows the components of a typical general-purpose computer suitable for performing the exemplary embodiment ~~invention~~.

FIG. 2 illustrates the functional programme elements that interact to perform the process of the exemplary embodiment. ~~invention~~

FIG. 3 is a flow chart illustrating the initial stages of the process of the exemplary embodiment ~~invention~~.

FIG. 4 is a flow chart illustrating the subsequent stages of the process of the exemplary embodiment ~~invention~~.

Pages 3-4, immediately preceding the bridging paragraph, insert the following heading:

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Page 5, 1st full paragraph:

The program retrieved from the store interprets the rule in two ways. Firstly, the program contains instructions as to how the agent should generate messages and responses at a given phase in the interaction. Secondly, ~~itsets~~ it sets bounds on the bids that the agent should evaluate for utility at this phase of the interaction. Bids can be considered mathematically to be sets of curves[[,]] (or sets of points if the solutions are constrained to take discrete values), representing the conditions that agents are prepared to declare as being possible at the current phase of the interaction.

Page 6, paragraph commencing at line 29:

Some phases may take a predetermined number of rounds. In a single round phase (45, 46), there is just one exchange of messages (propose 45: accept/reject 46)[[)]]. In a double round phase (not shown in FIG. 4), there are three steps: (propose: counter-propose: accept/reject).

Pages 7-8, bridging paragraph:

The platform 22 may be instructed to navigate non-sequentially to any negotiation phase. The initiator 21 can also alter the negotiation rules at run time. The platform 22 provides a default evaluation according to the Pareto optimisation process. This process generates a matrix which produces the optimum overall score. The

implication is that if any alternative matrix would be better, for all participants, than the one generated by the decision-making process, this alternative will be selected automatically. In other words, the decision-making process cannot generate a request matrix that is sub-optimal to an offered matrix if such alternatives would not be acceptable to one or the other party. To override this behaviour, the decision-making process must be capable of overriding the transition process selected by the program. The decision-making process adheres to a defined programmatic interface [AgentFunction]. The decision-making process can rewrite itself at run time[[;]], or it can register another decision-making process program for a negotiation phase. The platform uses an adaptive loader program, which imports the program code that it runs to make a decision as it runs and updates it regularly during running. Code is loaded at every discrete time of the negotiation session.

Page 8, 3rd and 4th full paragraphs:

Definition step: preparation of a set of evaluation functions and a set of sequent rules. These are placed in the interpretation store.

Intialisation Initialisation step: Definition of the rule of the negotiation (number of phases, message rules per sequence, good at sequence, timings/exit/entry criteria) and publication to the advertising directory. The initiator constructs the rule from its

interpretation store, either due to a program or due to rules defined by a programmer that act over the initiator's current perceived requirements.

Page 12, final paragraph:

The process could be extended to a many-many situation. The process would be continuous, and the participants would all advertise their participation through a publicly advertised known contact point. An ACID transaction mechanism could be used to underpin the system to prevent double commitment, although some protocols such as contract nets specifically impose risk on the bidding agents--forcing rational agents to bid lower to account for the risk of an unwanted purchase. Participation and drop out[[,]] would be possible ad hoc. As will be understood by those skilled in the art, any or all of the software used to implement the invention can be embodied on any suitable transmission and/or storage medium using any suitable carrier readable by a suitable computer input device, such as CD-ROM, optically readable marks, magnetic media, punched card or tape, or on an electromagnetic or optical signal, so that the program can be loaded onto one or more general purpose computers, or downloaded over a computer network using a suitable transmission medium.